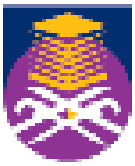

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Name : ZAKIUDDIN BIN JANURI

Title : PYROLYTIC OIL SYNTHESIS VIA CATALYTIC MICROWAVE ASSISTED PYROLYSIS OF AUTOMOTIVE PAINT SLUDGE BY USING ZSM-5 CATALYST

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Pyrolytic oil produced from automotive paint sludge (APS) through microwave assisted pyrolysis process has a great potential to be used as an alternative fuel. Calorific value of APS pyrolytic oil achieved almost 35MJ/kg and enriched with monoaromatic hydrocarbon which is not achievable in previous study by past researcher's due to the volatile released during drying process which is required by the pyrolysis equipment. However, high oxygenated hydrocarbon compound in the APS pyrolytic oil makes the pyrolytic oil still not achieve the standard requirement of commercial fuel, which the density and viscosity of APS pyrolytic oil is far from the standard due to high oxygenated hydrocarbon. Optimization is done on the process but only permits slightly increased on the pyrolytic oil yield. In addition, it reduced the quality of pyrolytic oil in terms of physical and chemical properties. Oxygenated hydrocarbon was increased to 53.1% of percentage area concentration. This is due to high radiation time need in the optimization method which the formation of more oxygenated and polycyclic aromatic compound. In order to meet the requirement of standard commercial fuel, improvement has been made by introducing catalyst ZSM-5 during the microwave pyrolysis process. As a result, calorific value of APS pyrolytic oil increased to 41 – 46 MJ/kg, which is higher than non-catalytic APS pyrolytic oil. This is due to the increased of hydrocarbon breakdown during the released of volatile compound and form high monoaromatic hydrocarbon and reduction of high oxygenated hydrocarbon compound. Catalytic microwave assisted pyrolysis of automotive paint sludge has been optimize in this research by using RSM-CCD method. It was found that the pyrolytic oil yield was increased to 0.875% by using optimized parameter of 1.24% catalyst mixing ratio, 200g of sample weight loading, 873.5W of microwave power level and 49.9 minutes of radiation time. Moreover, optimized physical properties were determined at 44.7 MJ/kg of calorific value, 4.71 cP of viscosity and 837 kg/m3 of density. Optimized method achieved its target by having low catalyst loading and microwave power level used in the process with the increased yield of pyrolytic oil and its properties which lead to the efficient operating condition at optimum output. Properties of APS pyrolytic oil is improved significantly with the presence of catalyst ZSM-5 and it became more feasible to be used as a commercial fuel.